

Application No. 10/525,618
Amendment Dated September 24, 2007
Reply to Office Action of June 28, 2007

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claim 1 (cancelled)

Claim 2 (currently amended): ~~The well injection string (4) according to claim 1,~~A well injection string for injection of a fluid into at least one reservoir intersected by the string, in which at least a part of the injection string includes at least one fluid outflow zone provided with one or more through-going pipe wall openings located opposite the reservoir when placed therein, and in which at least one pressure-loss-promoting flow control device in the form of a flow restriction is provided to at least one of said pipe wall openings in the injection string, the flow control device controlling the injection fluid outflow rate therethrough and onwards into the reservoir when placed therein, characterized in that said flow restriction is selected from the following types of flow restrictions:

-a nozzle;

-an orifice in the form of a slot or a hole; and

-a sealing plug; and

characterized in that said flow restriction is provided as a removable and replaceable insert ~~(12)~~that nests with the pipewall opening from outside of the injection string.

Claim 3 (currently amended): The well injection string~~(4)~~ according to claim 2, characterized in that the insert~~(12)~~ is disposed in an insert bore~~(28)~~ in the pipe wall of the string~~(4)~~, the bore~~(28)~~ comprising said pipe wall opening in the injection string~~(4)~~, whereby said outflow zone may be provided with several insert bores~~(28)~~, each bore~~(28)~~ containing a removable insert~~(12)~~.

Claim 4 (currently amended): ~~The well injection string (4) according to claim 2,~~A well injection string for injection of a fluid into at least one reservoir intersected by the string, in which at least a part of the injection string includes at least one fluid outflow zone provided with one or more through-going pipe wall openings located opposite the reservoir when placed therein, and in which at least one pressure-loss-promoting flow control device in the form of a flow restriction is provided to at least one of said pipe wall openings in the injection string, the flow control device controlling the injection fluid outflow rate therethrough and onwards into the reservoir when placed therein, characterized in that said flow restriction is selected from the following types of flow restrictions:

- _____ a nozzle;
- _____ an orifice in the form of a slot or a hole; and
- _____ a sealing plug;

characterized in that said flow restriction is provided as a removable and replaceable insert; and

characterized in that the insert-(12) is disposed in an axially through-going insert bore-(32, 92) in an annular collar-(34, 90) disposed pressure-sealingly around the injection string-(4) so as to project outwardly therefrom; and wherein the collar-(34, 90) also is disposed pressure-sealingly against an external and removable housing-(36, 42, 86) pressure-sealingly enclosing said at least one pipe wall opening-(28, 87) in the injection string-(4), thereby providing a through-going flow channel-(38, 88) between the collar (34) and the at least one pipe wall opening-(28, 87), whereby the collar-(34, 90) may be provided with several insert bores-(32, 92) around the circumference thereof, each bore (32, 92) containing a removable insert-(12).

Claim 5 (currently amended): The well injection string-(4) according to claim 2, characterized in that an outflow zone having two or more inserts-(12) arranged thereto, is provided with a mixture of said types of flow restrictions.

Claim 6 (currently amended): The well injection string-(4) according to claim 2, characterized in that an outflow zone arranged with two or more inserts-(12) containing a nozzle or an orifice each, is provided with nozzles or orifices of similar or dissimilar internal opening sizes.

Claim 7 (currently amended): The well injection string-(4) according to claim 2, characterized in that the inserts-(12) in the string-(4) are of identical external size and shape.

Claim 8 (currently amended): The well injection string-(4) according to claim 4, characterized in that the downstream side of said housing-(36, 42, 86) is extended axially and past said collar-(34, 90), said extension of the housing-(36, 42, 86) thereby forming a through-going and annular fluid collision chamber-(48, 100) within which the injection fluid is subjected to a pressure-reducing energy loss.

Claim 9 (currently amended): The well injection string-(4) according to claim 8, characterized in that a flow-through grid plate or perforated plate-(50) of erosion-resistant material is disposed in said fluid collision chamber-(48, 100).

Claim 10 (currently amended): The well injection string-(4) according to claim 4, characterized in that the downstream side of the housing-(36, 42, 54, 86) is connected to a sand screen-(44, 98).

Claim 11 (cancelled)

Claim 12 (currently amended): ~~The method according to claim 11, characterized in that the method further comprises:~~
A method of controlling an injection fluid outflow rate from at least one fluid outflow zone of a well injection string intersecting at least one reservoir.

the at least one fluid outflow zone being provided with one or more through-going pipe wall openings located opposite the reservoir when placed therein, said method being initiated by injecting said fluid from a surface via the injection string and then through at least one pressure-loss-promoting flow control device in the form of a flow restriction provided to at least one of said pipe wall openings in the injection string, after which the injection fluid flows onwards into the surrounding reservoir, characterized in that the method further comprises selecting said flow restriction from the following types of flow restrictions:

- a nozzle;
- an orifice in the form of a slot or a hole; and
- a sealing plug; and

forming said flow restriction as a removable and replaceable insert (12)that nests with the pipewall opening from outside of the injection string.

Claim 13 (currently amended): The method according to claim 12, characterized in that the method further comprises:

- disposing the insert-(12) in an insert bore-(28) in the pipe wall of the string-(4), the bore-(28) comprising said pipe wall opening in the injection string-(4), whereby said outflow zone may be provided with several insert bores-(28), each bore-(28) containing a removable insert-(12).

Claim 14 (currently amended): ~~The method according to claim 12, characterized in that the method further comprises:~~A method of controlling an injection fluid outflow rate from at least one fluid outflow zone of a well injection string intersecting at least one reservoir, the at least one fluid outflow zone being provided with one or more through-going pipe wall openings located opposite the reservoir when placed therein, said method being initiated by injecting said fluid from a surface via the injection string and then through at least one pressure-loss-promoting flow control device in the form of a flow restriction

provided to at least one of said pipe wall openings in the injection string, after which the injection fluid flows onwards into the surrounding reservoir, characterized in that the method further comprises selecting said flow restriction from the following types of flow restrictions:

- a nozzle;
- an orifice in the form of a slot or a hole; and
- a sealing plug;

forming said flow restriction as a removable and replaceable insert; and

disposing the insert-(12) in an axially through-going insert bore-(32, 92) in an annular collar-(34, 90) disposed pressure-sealingly around the injection string-(4) so as to project outwardly therefrom, the collar-(34, 90) also being disposed pressure-sealingly against an external and removable housing-(36, 42, 86) pressure-sealingly enclosing said at least one pipe wall opening-(28, 87) in the injection string-(4), thereby providing a through-going flow channel-(38, 88) between the collar-(34) and the at least one pipe wall opening-(28, 87), whereby the collar-(34, 90) may be provided with several insert bores (32, 92) around the circumference thereof, and a removable insert-(12) being disposed in each bore-(32, 92).

Claim 15 (currently amended): The method according to claim 12, characterized in that the method further comprises:

- providing an outflow zone having two or more inserts-(12) arranged thereto, with a mixture of said types of flow restrictions.

Claim 16 (currently amended): The method according to claim 12, characterized in that the method further comprises:

- providing an outflow zone having two or more inserts-(12) arranged thereto, with nozzles or orifices of similar or dissimilar internal opening sizes.

Claim 17 (currently amended): The method according to claim 12, characterized in that the method further comprises:

- providing the string-(4) with inserts-(12) of identical external size and shape.

Claim 18 (currently amended): The method according to claim 14, characterized in that the method further comprises:

- extending the downstream side of said housing-(36, 42, 86) axially and past said collar-(34, 90), the extension of the housing-(36, 42, 86) thereby forming a through-going and annular fluid collision chamber-(48, 100) within which the injection fluid is subjected to a pressure-reducing energy loss.

Claim 19 (currently amended): The method according to claim 18, characterized in that the method further comprises:

- disposing a flow-through grid plate or perforated plate-(50) of erosion-resistant material in said fluid collision chamber-(48, 100).

Claim 20 (currently amended): The method according to claim 14, characterized in that the method further comprises:

- connecting the downstream side of the housing-(36, 42, 54, 86) to a sand screen-(44, 98).

Claim 21 (currently amended): A well injection string-(4) for injection of a fluid into at least one reservoir-(6) intersected by the string-(4), in which at least a part of the injection string-(4) includes at least one fluid outflow zone provided with one or more through-going pipe wall openings-(28) located opposite the reservoir-(6) when placed therein, and in which at least one pressure-loss-promoting flow control device is provided to at least one of said pipe wall openings-(28) in the injection string-(4), the flow control device

controlling the injection fluid outflow rate therethrough and onwards into the reservoir-(6) when placed therein, characterized in that the flow control device comprises an annular collar-(56) provided with at least one axially through-going bore-(58); wherein the collar (56) is disposed pressure-sealingly around the injection string-(4) so as to project outwardly therefrom; and wherein the collar-(56) also is disposed pressure-sealingly against an external and removable housing-(54) pressure-sealingly enclosing said at least one pipe wall opening-(28) in the injection string-(4), thereby providing a through-going flow channel-(38) between the collar-(56) and the at least one pipe wall opening-(28).

Claim 22 (currently amended): The well injection string-(4) according to claim 21, characterized in that two or more collars-(56) are connected in series when placing two or more flow control devices within one fluid outflow zone along the injection string-(4).

Claim 23 (currently amended): The well injection string-(4) according to claim 21, characterized in that a collar-(56) having two or more axial bores-(58), is provided with bores-(58) of similar or dissimilar diameters.

Claim 24 (currently amended): The well injection string-(4) according to claim 21, characterized in that at least one bore-(58) is provided with a sealing plug.

Claim 25 (currently amended): The well injection string-(4) according to claim 21, characterized in that the collar-(56) is removably, pivotally or adjustably disposed around the injection string-(4).

Claim 26 (currently amended): The well injection string-(4) according to claim 21, characterized in that said housing-(54), or a cover provided thereto, is removably disposed around the injection string-(4).

Claim 27 (currently amended): The well injection string-(4) according to claim 21, characterized in that the downstream side of the housing-(54) is connected to a sand screen-(44).

Claim 28 (currently amended): A method of controlling an injection fluid outflow rate from at least one fluid outflow zone of a well injection string-(4) intersecting at least one reservoir-(6), the at least one fluid outflow zone being provided with one or more through-going pipe wall openings-(28) located opposite the reservoir-(6) when placed therein, said method being initiated by injecting said fluid from surface via the injection string-(4) and then through at least one pressure-loss-promoting flow control device provided to at least one of said pipe wall openings-(28) in the injection string-(4), after which the injection fluid flows onwards into the surrounding reservoir-(6), characterized in that the method further comprises:

- using an annular collar-(56) provided with at least one axially through-going bore-(58) as a flow control device;
- disposing the collar-(56) pressure-sealingly around the injection string-(4) so as to project outwardly therefrom; and
- disposing the collar-(56) pressure-sealingly against an external and removable housing-(54) pressure-sealingly enclosing said at least one pipe wall opening (28) in the injection string-(4), thereby providing a through-going flow channel-(38) between the collar-(56) and the at least one pipe wall opening-(28).

Claim 29 (currently amended): The method according to claim 28, characterized in that the method further comprises:

- connecting two or more collars-(56) in series when placing two or more flow control devices within one fluid outflow zone along the injection string-(4).

Claim 30 (currently amended): The method according to claim 28, characterized in that the method further comprises:

- providing a collar-(56) having two or more axial bores-(58), with bores-(58) of similar or dissimilar diameters.

Claim 31 (currently amended): The method according to claim 28, characterized in that the method further comprises:

- providing at least one bore-(58) with a sealing plug.

Claim 32 (currently amended): The method according to claim 28, characterized in that the method further comprises:

- disposing the collar-(56) removably, pivotally or adjustably around the injection string-(4).

Claim 33 (currently amended): The method according to claim 28, characterized in that the method further comprises:

- removably disposing said housing-(54), or a cover provided thereto, around the injection string-(4).

Claim 34 (currently amended): The method according to claim 28, characterized in that the method further comprises:

- connecting the downstream side of the housing-(54) to a sand screen (44).